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ABSTRACT

The Center for Cooperative Research with Schools (CReWS) contracted to develop a management information system (MIS) for the National Regional Resources Center of Pennsylvania (NRRCP). The system was originally intended to transform NRRCP data into management--oriented information to support decision-making within the agency. After a year's work, however, the NRRCP was pressured by its funding sources for accountability data and thus requested the fast delivery of a completely different MIS stressing project monitoring, cost analysis, and benefit assessment. The resulting MIS generated voluminous reports, but little useful information, and the cost in staff time was high. CReWS's experience has led to the following four conclusions. First, the demand for accountability generally leads to detailed but incomprehensible reports. Second, a useful MIS cannot be developed until the agency first clearly defines its goals. Third, the expected benefits of new management tools are usually unrealistic. Finally, information and management consultants should be wary of taking the practitioner's word for what he needs. An objective need assessment is more likely to result in the production of a useful, relevant management system. (PB)

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COMING OF AGE OF THE FAMILY CReWS: A BALLET IN THREE ACTS

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by

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I. THE BALLET

Once upon a time in the State of Pennsylvania and the County of Centre, there lived a quiet family called CReWS (Center for Cooperative Research with Schools). With all good conscience and high inspiration, the family CReWS devoted itself to spreading systems approaches throughout the land, and soon it was proselytizing and practicing the ancient art of grantsmanship.

It came to pass that the men of CReWS encountered a group with need (and with money), and soon a deal was made, that to the National Regional Resources Center of Pennsylvania (NRRC/P) would be delivered an elixir--an MIS to solve its problems.

The story which follows, dear reader, is of the attempt to make that elixir, and of the coming of age of the family CReWS which accompanied it. It is a ballet in three acts: a stately minuet, an explosive flamenco, and a hectic jitterbug.

Before this saga goes on, you must first be told that NRRC/P is a statewide group concerned with the education of handicapped children. It both develops procedures for this work and disseminates the procedures to public

school systems and their people. In the beginning, NRRC/P had multitudes of data. The elixir was to change these base data into the gold of management-oriented information.

THE MINUET

The minuet, stately and dignified, began with a request to CReWS to design and implement a management information system (MIS) to support administrative decision making. The MIS was to include evaluation, accountability, and cost data. The capstone of the system was to be a cost-benefit capability --at least to the extent possible given the current state of the art.

Production of Background Data

The first task was to study the agency. An intensive field study, which included interviews, site-visits, workshops with agency personnel, examination of forms, and analysis of the agency's reporting requirements, was conducted.

The interviews were with the agency's top personnel. They were open-ended discussions which covered these points:

1. Main characteristics of each administrative unit.
2. Boundaries of each unit.
3. Major activities of each unit.
4. Future opportunities.
5. Major stumbling blocks or problems.
6. Needs of the target children and schools.
7. Major objectives of each unit.
8. Major resources of each unit.
9. Major strategies utilized to achieve the objectives.
10. Evaluation efforts currently under way.

11. Issues or areas of the unit's operations where more information is needed.

12. Records maintained.

The interviews were followed by site visits and observations of instructional personnel in 15 different schools. The site visits had multiple purposes, including:

- Observation of the various instructional personnel.
- Observation of the record keeping and report generating required of the staff.

The site visits included classroom observations and conversations with teachers and aides, principals, parents, and school support personnel such as psychologists and counselors.

The interviews and site visits provided data for an analysis of the agency with two primary concerns:

1. The constraints and limitations on the agency.
2. The set of strategies and procedures the agency intended to operationalize in the field.

The latter part of the analysis (the strategies and procedures) provided the basis for two models of staff activities--one each for teaching and for management staff. CReWS staff also conducted two workshops designed to elicit input from a broad cross-section of agency personnel. The first of these focused on clarifying evaluation concerns, the second on refining the model of staff activities. After these activities, CReWS staff had an in-depth understanding of the agency and its needs, and it began to design the output capability of the proposed MIS. The intention was to provide summary information, changes over time information, and cost-ratios information.

Development of the Time Accounting System

The models of staff activities were pressed into service immediately. One of NRRC/P's big unknowns was the pattern of time expenditure for the various staff types. A Time Accounting system, designed to document the actual time expenditure pattern, was implemented during the first year. The Time Accounting system was a straightforward process for the staff to log their time in each of a variety of activities. The data was then computer processed and summarized by staff type.

The models of staff activities utilized two different taxonomic schemes: 1) activities grouped by project goal, and 2) activities grouped by type of service. The "Teacher Time-Record Form" utilized the "activities by type of service classification. These data permitted determination of the relative costs of the various services provided to children and school staff. They also provided a check on the extent to which the staff were in fact functioning in the manner that the project managers intended, i.e., the extent to which the instructional model was being implemented.

The "Manager's Time-Record Form" utilized the "activities by project goal" classification. This data permitted determination of costs for each of the project goals as well as a baseline for patterns of management activities.

The Time-Record data is collected on a form that has activities listed down the side and the days of the month across the top. The Teachers form has two pages and the Managers form has five pages (see Appendix). At the end of each day, each staff member records his time in half-hour units for each activity engaged in.

The Time-Record forms are collected at the end of the month, keypunched, and run through a computer program which provides a variety of reports, including breakdowns for each staff type by each administrative unit. The program generates monthly reports and cumulative reports for three-month periods. The reports were generated for each operational sub-unit of the organization, and were aggregated from these to the State as a whole.

THE FLAMENCO

Just at the point when CReWS staff felt it was evolving a workable and useful MIS design, the tempo abruptly changed. The explosive, improvisional flamenco arrived when the agency director, in a flash of insight, said, "Here, this is what I want," and pointed to a manual for a different sort of MIS used in another educational agency. An accountability data system (sort of!) was needed and was needed immediately. The funding agencies were demanding it and it therefore had to be provided. The fact that a year's planning and developmental activity had gone into a different design was of no avail.

Intended outcomes such as support for decision-making, utility to agency personnel, reports depicting changes over time, cost-ratio information and summary information were displaced by the urgent need to have accountability data immediately. The extensive field work and planning were suddenly background material rather than primary planning data. A short period of acute shock followed as the staff tried to learn the new dance and to re-orient its objectives and activities for the project. Year-at-a-time funding contributed to the susceptibility of CReWS to the agency director's changing insights.

THE JITTERBUG

The third and last phase was a mad rush akin to an uninhibited jitterbug--a hectic, arm-flailing, full speed ahead implementation of a system to generate accountability data. The major activities consisted of designing report formats, forms and procedures to collect the data, and computer routines to process the data.

The procedure for implementing the "accountability data now" MIS was to separate it into a number of modules. These modules were in the general areas of project monitoring, cost accounting, and benefit assessment. Figure 1 provides an outline of the various modules as they were conceptualized during this stage.

Project Monitoring	Cost Analysis	Benefit Assessment
Product Monitoring	Cost Accounting	Service Impacts
Service Monitoring	Time Accounting	Product Impacts

Figure 1

The overall strategy for designing the MIS shifted considerably at this point. During the earlier phase, the strategy was to focus on the utility of information for decision making. Operationally, this meant that the final products were designed first, and the rest of the system emerged as staff worked backward from that intended end result. Now, with the pressing

need to have something operational, the focus of attention shifted to the structure outlined in Figure 1. The final objective was unknown and would be determined as it emerged from the process of combining the pieces.

CReWS work to date has focused on three of the modules (Product Monitoring, Time Accounting, and Cost Accounting). The functions of these are:

Product Monitoring - For each special project the agency is to carry out, a detailed plan (much like a PERT network) is prepared. This plan is revised monthly as a means of monitoring the progress of the project.

Time Accounting - Each staff member records his time expenditure using a set of activities designed to include all of his routine duties. The entries are made daily to the nearest half hour. Note that this is a continuation of the system developed in the Minuet phase.

Cost Accounting - The bookkeeping procedures are designed to allow cost accounting by objective, by service types, and by goal as well as by traditional line item budget categories.

NRRC/P has a large scale in-house data collection system that is particularly relevant to the service monitoring and service impacts modules. The data collected by this system are in the form of detailed histories for individual students. Thus, despite a massive data base, there is no information in a form that is illuminating for management decisions.

At the present stage of development, several generalizations can be made about these modules:

1. A great deal of data is collected.

2. Very detailed and voluminous reports are generated.
3. There is very little in the way of summary reports, or a capability for juxtaposition of data from two or more sources, or reports which show changes over time.
4. A not-inconsiderable amount of the entire staff's time is required to support the data collection effort.
5. While the product at this point is undeniably useful to the agency, the elixir of information for management decision-making is yet to be produced. The crisis orientation, the departure from a long-range planning perspective, the failure to employ a systems perspective instead of just systems analysis tools--all have contributed to a situation characterized by a multitude of data and little information.

II. COMING OF AGE

It is instructive to look back and reflect on the project to this point, on the changes of tempo and harmonics, and on the maturity this has produced within CReWS. In retrospect, a number of lessons seem clear. Further, these lessons seem common to many educational projects, and perhaps others can come of age by reflecting on them.

DEMAND FOR ACCOUNTABILITY

The various publics of educational institutions are all demanding accountability data. In the case of the NRRC/P, this demand came from

the Bureau of Education for the Handicapped in Washington (the source of funds via the State), from the State Department of Special Education, from the cooperating school districts, and from parents. The cry for accountability is generally interpreted as a demand for data which "proves" that the institution is at least making good progress toward its proper goals. The usual result of attempting to provide accountability data, as with the NRRC/P Project, is to generate reports which are totally incomprehensible by way of their voluminous variety of detail.

UNDEFINED VALUES AND GOALS

Education has been (and perhaps always will be) characterized by vague and ambiguous values and goals. Without entering the debate over behavioral objectives, we simply note that the NRRC/P, like other educational agencies, has great difficulty in stating broad operational objectives for itself. A closely related point is the lack of explicitly stated global goals or value judgments for the agency. To the extent that such global goals and value judgments are absent, a number of crucial difficulties[1] in organizational planning and management arise:

1. It is correspondingly difficult to determine the alternative strategies or the future decisions facing the agency.

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[1]This section owes a great debt to Dr. Robert Mowitz, Director of The Institute for Public Administration, The Pennsylvania State University, and his work with Planning, Programming, Budgeting Systems (PPBS) at the State government level. See for instance his report on The Pennsylvania PPBS, The Design and Implementation of Pennsylvania's Planning, Programming, Budgeting System, Institute of Public Administration, PSU, 1970.

2. It is difficult to define the information needs of the agency. Information is needed to evaluate strategies, provide data for various types of decisions, and generate feedback on current operating characteristics. If the strategies and decisions are unknown, the needed information is necessarily unspecifiable.
3. It is difficult to interpret the data that are collected. Interpretation of program data for decision-making always implies a value judgment (i.e., higher reading scores are preferred to lower, more independence is preferred to less, lower costs are preferred to higher, faster progress is preferred to slower). In practice, we generally operate by gathering data relevant to many of our strong values. However, we seldom make these values explicit. We therefore have no explicit way of interpreting the data, and we tend to become involved in mere counting of uninterpretable entities.

   It can be argued that people do in fact interpret their data on the basis of implicit values. Note, however, that this makes the process vary subjective and not susceptible to a scientific reconciliation of differences, because the major premises (and therefore applicable values) may be different for different parties.
4. There is another dimension to the problem of interpreting data. Given an explicit goal (i.e., a well-defined value statement specifying the preferred conditions), then operational objectives and sub-objectives become working hypotheses on the causal relationships in the system. In other words, given goal A and objectives x, y, and z, the working hypothesis is obviously that achieving objectives x, y, and z will move toward goal A.

Educators (including the present authors) have, for a variety of reasons, generally failed to make explicit connections between program objectives and overall goals. In the absence of explicit hypotheses related to these connections, we will continue to be ignorant about the ways program effectiveness can be improved, no matter how much raw data we collect.

MODERN MANAGEMENT TOOLS

Educators are responding rapidly to a variety of forces tending toward utilization of modern management tools such as PERT, PPBS, MIS, and systems analysis. These management methods were, by and large, pioneered by the Pentagon and popularized by industry. They have been adopted to some extent by other branches of the federal government and some state governments.

As with anything new, the expectations and the reality never match in toto; all too often, they are orders of magnitudes apart. Wildavsky, the most persistent and perspicacious critic of the whole approach, has long argued that a) it won't work, and b) if it did work, it would be worse than what we do now.

Given the pressures and the temper of our times, one can safely predict that at least some educational institutions will rush to adopt new methods that are inappropriate to their needs. The new methods are tools--no more, no less. Many of them are unreasonably expensive for installation in most situations. Furthermore, lacking experience with them as we do, there is no way to guarantee that they will perform as expected in an educational milieu. We will do well to proceed with caution and a thoroughly scientific temper. Wildavsky (1973) suggests ten precautionary rules for those considering an MIS:

1. The rule of skepticism: no one knows how to do it. Unless the idea is to subsidize employment of social scientists, the burden of proof should be on the proposer.
2. The rule of delay: if it works at all, it won't work soon. Be prepared to give it years.
3. The rule of complexity: nothing complicated works. When a new information system contains more variables than, shall we say, the average age of the officials who are to use it, . . . the chances of failure are very high.
4. The rule of thumb: if the data are thicker than your thumb . . . they are not likely to be comprehensible to anyone.
5. The fifth rule is to be like a child. Ask many questions; be literal in appraising answers. Unless you understand precisely who will use each data bit, how often, at what cost, relevant to which decisions they are empowered to make, don't proceed.
6. Sixth is the rule of length and width . . . The longer the sequence of steps, the wider the band of clientele, the less likely the information is to be of use.
7. The rule of anticipated anguish . . . : most of the things that can go wrong will. . . . If you do not have substantial reserves of money, men, and time to help repair breakdowns, do not start.
8. The rule of the known evil. People are used to working with and getting around what they have.
9. The rule of the mounting mirage. . . . The possible benefits of better information, therefore, are readily apparent in the present. The costs lie in the future.

10. Hypothetical benefits should outweigh estimated costs by at least ten to one before everyone concerned starts seeing things.

Waddington (1974), an early pioneer in the field, suggests three more rules:

1. Don't be niggardly with time or money in getting the real facts (not opinions, facts).
2. Weave backward and forward from model-making to testing the effects of interim decisions.
3. It is rarely worth altering existing procedures, which everyone concerned is used to, unless the forecast increase in efficiency is at least 50 percent, preferably 100 percent, to be attained in some reasonably short period, before the next alteration becomes necessary.

Reading these rules of thumb is extraordinarily depressing. Waddington's experience, as is most of the experience with these methods, has been with the military. Not only are we educators working with more complex systems than the military or business, it seems much less likely that we will be provided with the requisite resources in men, machines, or time.

We are therefore presented with a singularly cruel dilemma. On the one side, the desperate need for more effective decision making is clear, as is the superiority of the modern management methods over traditional approaches. The other horn of the dilemma contains the potential, nay, the strong likelihood, that our attempts will be hamstrung through lack of resources. Even worse, an attempt to do an MIS without adequate resources

will almost certainly exacerbate the problems that led to the request for an MIS to begin with.

COMMUNICATION PROBLEMS

The difficulties of communication between the practitioner and the social scientist are legendary and well known to all of us. We continue, however, to fall in the same old traps. NRRC/P approached CReWS with a request to produce an MIS. Their language included phrases such as "support for decision-making," "evaluation," "accountability," "cost-benefit," and "cost-effectiveness." Our own predilections were quite compatible; in short, we were excited and jumped at the chance to develop such a sophisticated MIS.

We were very careful to warn the NRRC/P of the (probable) impossibility of providing a real cost-benefit capability. We similarly gave solemn and frequent warnings about the difficulties and amount of work involved in the whole enterprise. NRRC/P, for their part, continued to repeat their needs and pressures on them from the state and the federal governments.

Despite all these discussions, the parties worked together for a full year (conducting the field study primarily) before they really began to understand each other. It was mentioned earlier (page 5) that a traumatic change in direction (from CReWS perspective) occurred half way through the project. In retrospect, it seems incredible that CReWS and NRRC/P could have misunderstood each other to such an extent for so long. We would not have the courage to report it --- except that history places us in very good company.

What can be done to avoid such problems in the future? Probably the major safeguard is to never, never simply take the practitioner's word for what he needs. Much more background information and understanding is necessary and explicit analysis of the situation is needed to produce that understanding. Had we carefully inquired about the concrete problems and external pressures that led to the request for an MIS, we would have saved a tremendous effort.

We might note that uncritical acceptance of the practitioner's word for what he needs is fraught with danger. Given that John Doe educator, harassed and overworked, has a problem. He will decide, on some basis, that the solution to said problem is to acquire and utilize a modern wombat. His next step, obviously, is to find an expert in providing wombats. Now it makes no difference whether the wombat is a curriculum guide, an adding machine, open education, or an MIS. The wombat expert has, almost by definition, an ideology which says that wombats are good and necessary for education. The expert, therefore, has a very strong temptation to congratulate the practitioner on his keen insight rather than inquiring as to whether wombats are truly what is most needed in this particular situation.

This is a danger facing everyone of us. Unless we are alert to it and firm in our repentance from it, we stand a chance of providing solutions for which no real problem exists. We will certainly expend scarce and irreplaceable resources on irrelevant projects. At worst, we may further exacerbate situations which were already exceedingly difficult, and in the process totally discredit the wombat. The history of education abounds with examples of wombats that were adopted with unreasonable expectations, only

to be inevitably followed by disillusionment and disdain for the poor wombat. All of us who are concerned with the educational enterprise would do well to constantly guard against this recurrent syndrome.

In addition to our own careful inquiry into the practitioner's concrete problems (as contrasted with his proposed solutions), it may be helpful to secure the analysis of a knowledgeable but disinterested third party.

In any event, the moral is clear that no magic solutions exist, and that rushing about without proper preliminary analysis, a proper time frame, proper understanding and commitment by all parties to the enterprise, and proper resources will be useless at best. Just as the medieval alchemists could never change base metals into gold, we cannot change poorly conceptualized and poorly planned efforts into shining successes through some formula. We do a disservice if we imply that we can. Finally and perhaps most importantly, systems tools have no intrinsic power to improve quality; apart from the broad perspective of general system theory the tools are largely impotent. The fact that these tools carry with them an aura of mystery and of scientific respectibility makes them attractive to the uninitiated--but no less impotent. If we aspire to be systems experts and to serve education, we are obliged to make ourselves expert in the general theory, to remove the aura, and to be prepared for long and arduous labor.

III. CONCLUSION

And thus did the family CReWS meet adversity and learn of elixirs and come of age in rapid time. CReWS lost its innocence but gained a certain humility and understanding, and lo, it goes forth even to this day to do good work and to follow the star of the systems approach.

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APPENDIX

THE FIRST PAGE OF THE "TEACHER'S TIME RECORD FORM"

BEST COPY AVAILABLE

TEACHER SUPPORT MODEL VII

NRRC/P GOALS & ACTIVITIES Report time to the nearest half hour.	Month DEC Year 1973 Code:	Respondent SARAH MILES Title RES TEACHER - 51 Unit MID. URBAN - 93 Location LINCOLN SCHOOL

Major Activity	Task Activities	Day / Date	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
A. Level 1 Activities (Identification)	-Acquiring and analyzing initial Referral information	1	1																		
	-Acquiring and analyzing Cumulative Record information	2																			
	-Acquiring, administering, or analyzing identification test inf	3	3½			1½															
	-Conferring with referring teacher(s) or other prof. persons	4			2																
	-Observing and analyzing Teacher-Child interactions	5	1																		
	-Documentation of identification infor. on appropriate forms	6				3½															
B. Level 2 Activities (Pre-Post Intervention Testing)	-Selecting, admin., scoring and interpre. of pre-post test infor.	7		4																	
	-Documenting pre-post test information (Form 19)	8			1	½															
C. Level 3 Activities (Content Diagnostic Test Information)	-Selec., admin., scoring, and interpre. content diagnos. tests	9			1																
	-Documen. of content diagnostic test information (Form 19)	10			1½																
D. Level 4 Activities (Process Diagnostic Test Information)	-Selec., admin., scoring, and interpre. process diag. test info.	11			2½																
	-Documentation of Process Diagnostic information	12																			
E. Level 5 Activities (Selecting and assessment of learning objectives)	-Selecting or writing approoriate learning objectives	13																			
	-Selecting or writing appropriate test of objectives	14																			
	-Admin., scoring and interpreting objective referenced tests	15																			